

## EFFECT OF KHAT (*CATHA EDULIS*) CONSUMPTION ON THE FUNCTIONS OF LIVER, KIDNEY AND LIPID PROFILE IN MALE POPULATION OF JAZAN REGION OF KINGDOM OF SAUDI ARABIA

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### ABSTRACT

We have investigated the impact of Khat consumption on the liver and renal functions of the users of Jazan region of Saudi Arabia. The effect of Khat chewing has also been evaluated on the profile of lipids. This study was mainly conducted to examine the liver and kidney functions of the people using every day Khat. We collected blood from 50 Khat-users and 50 users living in this part of the country. Khat-users exhibited increased serum concentration of aspartate aminotransferase (AST), Alanine aminotransferase (ALT) and alkaline phosphatase (ALP) as compared to the non-users, control. The concentration of serum creatinine, urea and uric acid was significantly higher in khat users than the healthy non-users. Total fats and triglycerides level was also quite high in khat consuming people while HDL and LDL values were low as compared to the control non-users. In conclusion, we can say that components present in Khat are responsible for hepatic and nephrotoxicity in male Khat users.

**Abbreviations:** AST, Aspartate Aminotransferase; ALT, Alanine Aminotransferase; ALP, Alkaline Phosphatase; TB, Total Bilirubin; A, Albumin; Tc, Total Cholesterol; LDL-c, Low Density Lipoprotein Cholesterol; HDL-c, High Density Lipoprotein Cholesterol; TGs, Triglycerides.

**KEYWORDS:** Khat (*Catha edulis*), Kidney, Lipid Profile, Liver

### INTRODUCTION

Khat (*Catha edulis*) tree is commonly found near to Red Sea, North-East Africa and the Middle East. Khat leaves has been chewed for centuries by the people of various countries such as Yemen, Ethiopia, Eritrea, Somalia and Kenya for its stimulant properties (Numan, 2012; Thomas and Williams, 2014). However, Khat becomes a serious public health and socioeconomic problems in these countries (Hassan et al., 2007; Ageely, 2008). The WHO (2003, 2006) recorded that Khat consumption has created a major health problems by affecting numerous vital organs of the human body (Alsalahi et al., 2012).

The work on the adverse effects of Khat has already been earlier reviewed (Cox and Rampes, 2003). Luqman and Danowski (1976) reported liver cirrhosis among Yemeni population that might be due to Khat consumption, however these investigators did not report any specific reason. Moreover, some workers have demonstrated that the administration of crude extract of Khat to New Zealander white rabbits for three months resulted into hepatocellular jaundice and histopathological abnormalities in the livers of these experimental animals (Al-Mamary, et al., 2002).

Furthermore, a long term feeding of crude extract of khat to similar animals was done and after six months histopathological evidence from liver sections showed periportal fibrosis which is an initial stage for liver cirrhosis but they did not find any effect on the function of kidneys (Al-Habori, 2002). In recent years, some studies have reported an adverse effect of Khat on the liver of humans (Peevers et al., 2010; Stuyt et al., 2011). The consumption of Khat can cause various physiological and socio-economic impacts, which have put a control on its use by several countries including the Kingdom of Saudi Arabia. However, in some parts of the kingdom still people are using it. In this study an effort has been made to evaluate the liver and renal functions and lipid profile in the serum of Khat users of Jazan region of Saudi Arabia. All the studies have been performed only in male population of the region.

## **MATERIALS AND METHODS**

### **Samples Collection**

The current study was conducted on the Khat consumers of Jazan region of Saudi Arabia. Patients attended the primary health centre at the first visit for the symptoms of liver problem and gave history of Khat chewing were recruited for this study. The selection of participants was based on the following inclusion and exclusion criteria: All participants were male Khat chewer, at the age above 20 years. Patients with history of drinking alcohol, hepatitis B virus and hepatitis C virus infection, hepatologic genetic disorders, liver problem due to hepatotoxicity by certain drugs were excluded from this study.

A total of 100 participants were included in this study. Fifty out of 100 participants were used as a case (Khat users). All the participants were interviewed by doctor and questionnaire was completed to cover the personal history of Khat chewing (amount of Khat per day, number of hours per day, number of days per week and number of years), smoking (cigarette and water pipe), hypertension, diabetes and any family history of liver problem. Those healthy participants who have no exposure of Khat chewing (non-Khat users) and smoking in their life time and have no family history of liver problem were used as a control. Written consent was taken from all the participants after explanation of the aim of the study.

### **Separation of Serum**

Fasting blood samples were collected into plain tubes and allowed to clot. The clot samples were centrifuged immediately for 10 min at 3000 rpm. After centrifugation, the serum was separated and transferred to a clean tube with the help of pipette. The tubes containing serum were transported to Biochemistry laboratory, College of Applied Medical Sciences, Jazan University to analyze the biochemical parameters.

### **Biochemical Analysis**

The biochemical parameters were analyzed in 10 µl aliquots of serum by auto-analyzer (Human Star 80, Human Diagnostic Worldwide, GmbH, Germany). Biochemical parameters included alkaline phosphatase (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), total bilirubin (TB), albumin (A), total cholesterol (Tc), low density lipoprotein cholesterol (LDL-c), high density lipoprotein cholesterol (HDL-c), triglycerides (TGs). The concentration of various biochemical parameters was examined in serum samples collected from khat users and non-users.

### Statistical Analysis

Data were statistically described as mean  $\pm$  SEM. The chi square test was used to compare the results. A probability value (*p*-value) less than 0.05 was considered statistically significant. The results were computed statistically with SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 19 for Microsoft Windows.

## RESULTS AND DISCUSSIONS

ALT and AST activities were significantly increased in the serum of Khat users (Table 1). The elevated level of total bilirubin and ALP activity was also noticed in the serum of these khat-users. However, the serum concentration of serum albumin was significantly decreased compared to non-khat users. Al-Hashem et al. (2011) have earlier described that administration of hydro-ethanol Khat extract to rats for 28 d resulted in a statistically significant increase in the serum activities of ALT, AST,  $\gamma$ -GT and ALP in Khat fed rats as compared to control. These workers have also found higher concentration of total bilirubin in the serum of Khat extract administered rats. A number of earlier studies have described that Khat consumption resulted in to severe acute liver injury and acute hepatitis (Brostoff et al., 2006; Saha and Dollery, 2006; Chapman et al., 2010). Patanwala et al. (20011) have reported a case of end stage chronic liver disease related to chronic Khat consumption and the outcome after liver transplantation.

The chemical components of renal function were statistically significantly enhanced in the serum of Khat consumers (Table 2). These results are in agreement with earlier finding which demonstrated that the administration of hydro-ethanol extract of Khat into rats resulted in significant increase in the serum level of urea, bilirubin and phosphorus ions, accompanied by significant decreases in serum total protein and albumin levels (Al-Hashem et al., 2011). Al-Habori et al. (2005) found that the administration of *Catha edulis* extracts showed a deranged systemic capacity to handle oxidative radicals and induces cytotoxic effects in cells of liver and kidney.

There was a significant enhancement in the concentration of total cholesterol and triglycerids in the serum of Khat addicting people (Table 3). However, HDL-c and LDL-c levels were markedly decreased in the serum of Khat users as compared to control subjects. In a recent study, Alrajhi and Yousef (2013) reported that feeding of rabbits with Khat leaves reduced total serum concentration of cholesterol, HDL-and LDL cholesterol. Cholesterol and HDL- cholesterol levels were still significantly decreases even after Khat withdrawal, whereas LDL- cholesterol was significantly increases compared to control group. However, the Khat fed rabbits showed significant increase in serum triglycerides and remain elevated even after the withdrawal from Khat.

## CONCLUSIONS

Khat-consumers of Jazan region of Kingdom of Saudi Arabia have evaluated for liver and renal functions and for lipid profile. This study showed that the serum biochemical parameters such AST, ALT, ALP, creatinine, urea, uric acid, total fats and triglycerides were significantly increases in khat users as compared to healthy non-users. However, HDL and LDL values were found quite low as compared to the control values. On the basis of the findings of this work it can be concluded that chemical constituents of Khat are affecting liver and kidney functions of the users. The elements of lipid profile were also influenced by the chemical components of Khat. In fact cathinone has closer resemblance to amphetamine and thus these compounds share common pharmacodynamic features. It led to the conclusion that cathinone is a most important active component of Khat which causes the major pharmacological effects. Problems associated with



repeated consumption of *Catha edulis* leaves are becoming evident. Khat consuming is social and financial burden on society therefore, its use should be strongly restricted.

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## APPENDICES

**Table 1: Biochemical Parameters for Liver Function in Khat User and Non-User**

Biochemical Parameters	Khat User	Non-User	p Value
Albumin (g/dl)	4.18 ± 0.21	4.28 ± 0.12	0.73
Total bilirubin (mg/dl)	0.98 ± 0.02	0.95 ± 0.02	0.44
Alkaline Phosphatase (unit/l)	188.49 ± 6.86	187.71 ± 10.27	0.94
ALT (unit/l)	43.09 ± 0.91	39.90 ± 0.56	0.02*
AST (unit/l)	39.37 ± 1.45	35.02 ± 0.67	0.04*

**ALT:** Alanin aminotransferase, **AST:** Aspartate aminotransferase, the values were expressed as mean ± SEM. The symbol (\*) indicated as significant difference at  $p > 0.05$

**Table 2: Biochemical Parameters for Renal Function in Khat User and Non-User**

Biochemical Parameters	Khat User	Non-User	p Value
Creatinin (mg/dl)	0.79 ± 0.02	0.66 ± 0.04	0.006*
Urea (mg/dl)	34.38 ± 1.75	31.94 ± 2.54	0.42
Uric acid (mg/dl)	5.73 ± 0.20	5.02 ± 0.21	0.03*

The values were expressed as mean ± SEM, the symbol (\*) indicated as significant difference at  $p > 0.05$

**Table 3: Lipid Profile in Khat Users and Non-Users**

Biochemical Parameters	Khat User	Non-User	p Value
Total cholesterol (mg/dl)	171.98 ± 3.45	180.64 ± 4.04	0.14
Triglyceride (mg/dl)	186.64 ± 2.58	95.24 ± 3.31	0.0001*
HDL-c (mg/dl)	53.21 ± 1.10	57.99 ± 1.22	0.009*
LDL-c (mg/dl)	86.83 ± 3.56	96.37 ± 5.04	0.12

**HDL-C:** High density lipoprotein cholesterol, **LDL-c:** Low density lipoprotein cholesterol, the values were expressed as mean ± SEM. The symbol (\*) indicated as significant difference at  $p > 0.05$

